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CHAPTER 1

GENERAL

1-1. Purpose and scope. This manual provides information for the investigation of concrete materials, proportioning, and construction of concrete pavements at Army mobilization facilities.

1-2. Strength and air content.

a. Responsibility for mixture proportioning. The responsibility for mixture proportioning will be assigned to the Contractor, and the Contracting Officer will approve the quality of all concrete materials used in the mixture. The Contractor will control all proportions of the concrete mixture necessary to obtain the strength and quality of the concrete required for the pavements.

b. Flexural strength. Airfield pavement and road pavement structural designs are based on flexural strengths that the concrete is expected to obtain at the ages of 90 and 28 days, respectively. However, due to the nature of the construction, a 7-day strength will be specified for control of the concrete mixture in the field. This strength requires that a reliable correlation be established at the ages of 7 days and 28 or 90 days for the concrete mixture to be used in road or airfield pavement construction, respectively. Flexural strength for all concrete pavements will be a minimum of 650 psi.

c. Test specimens. Flexural strength tests will be made on molded beam specimens of 6- by 6-inch cross-sectional dimensions in accordance with ASTM C 78. Standardization of the test specimen is necessary because of variations in the flexural strength obtained with specimens of different sizes. It is essential that the 6- by 6-inch molded beam specimen be used for all flexural strength determinations, in both laboratory and field.

d. Air content.

(1) Effects on air entrainment. Air-entrained concrete will be required for all concrete pavements. Air entrainment improves the workability and placing characteristics of freshly mixed concrete and increases the freezing-and-thawing resistance of hardened concrete. Some reduction in flexural strength, however, will usually result, nearly proportional to the percentage of air entrained in the concrete. Proper proportioning and control of the air-entrained concrete mixture are essential in order to derive maximum benefits from improvement in the placeability and durability of concrete with a minimum reduction in flexural strength.

(2) Percentage of air content. The specified air content will be 6 plus or minus 1-1/2 percent for concrete pavements located in

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regions where resistance to freezing and thawing is a prime consideration, and 5 plus or minus 1-1/2 percent for concrete pavements located in regions where frost action is not a factor and air entrainment is used primarily to improve the workability and placeability of freshly mixed concrete. Air content will be controlled in the field at the point within the specified range most appropriate for local conditions, depending upon the severity of exposure and the quality and maximum size of aggregate.

e. Cement content. A cement content of at least 470 pounds per cubic yard will be required for proposed roadways and runways. Cement content will be increased as necessary to achieve the minimum flexural strength.

1-3. Water. Water for mixing concrete will be free from materials that affect hydration of the cement. Potable water may be used without testing; however, tests will be made if the water source is a stream or another body of water of unknown quality.

1-4. Admixtures.

a. Air-entraining admixtures. The air-entraining admixtures used will be based on the necessary assurance that the proposed admixture will have no effects on the properties of the concrete other than those desired by the air entrainment. The admixture will be prepared in a solution for addition at the mixer and batched with the mixing water. When truck mixers are permitted, and it is impractical to add the air-entraining admixture with the water, addition of the admixture solution with the fine aggregate is permissible.

b. Other admixtures. Only accelerators and retarders may be specified or approved for use in concrete without prior approval of the Contracting Officer.

(1) Calcium chloride. In some instances, it may be desirable to require or permit the use of calcium chloride in concrete placed during cold weather in order to accelerate the set and thus permit the finishing and protection of the concrete without undue delay.

(2) Retarders. The use of a retarder should be considered when concrete is to be placed at temperatures exceeding 85 degrees F. or when problems in finishing are anticipated. The Contractor has the option of using a retarder for concrete temperatures of 85 degrees F. or below.

(3) Pozzolans. Fly ash or raw or calcined natural pozzolan may be used as part of the cementitious material up to 25 percent of the solid volume of portland cement plus pozzolan.

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1-5. Cement. Normally, portland cement will be limited to Type I or II, portland blast-furnace slag cement to Type IS, and portland-pozzolan cement to Type IP. When cements interground with an air-entraining admixture are permitted for use, the type designations for air-entraining cements will be included.

a. Low-alkali cement. When past-performance records demonstrate that the concrete aggregate to be used for a project is potentially reactive with alkalies in the cement, a low-alkali cement will be used.

b. High-early-strength cement. Concrete using Type III cement achieves about 75 percent of its design strength within approximately 3 days. This could be highly advantageous during a mobilization situation. However, its use should only be specified when absolutely necessary.

1-6. Delivery and storage of materials.

a. Cement and pozzolan. Separate storage facilities will be provided for each type of cementitious materials. Storage facilities will be thoroughly cleaned before changing the type of cementitious material stored in it. Storage facilities must be weathertight and be properly ventilated. Cement must be protected from dust, debris, and other contaminating substances.

b. Aggregates. Careful inspection of storage and handling operations is desirable to assure satisfactory control of the aggregate grading and contamination by foreign material. Uniformity of free moisture in aggregate is essential for proper control of concrete consistency. A period of free-draining storage is required for fine aggregates and the smaller size of coarse aggregate. Normally, 24 to 48 hours will be sufficient.

1-7. Pavement protection. All vehicular traffic should be excluded from the pavements for at least 14 days. As a construction expedient, earlier use of pavement is permitted for operations of construction equipment only as necessary for paving intermediate lanes between newly paved lanes. Approval for use of pavements for construction purposes prior to 14 days may be omitted from contract specifications if unnecessary or undesirable for local conditions. Operation of construction equipment on the edge of previously constructed slabs will be permitted only when concrete is more than 72 hours old and has a flexural strength of at least 400 psi. In all instances, approval for use of pavement will be based on adequate provisions for keeping pavements clean and protecting pavements against damage.